ORIGINAL ARTICLE

Prevalence rates for constipation and faecal and urinary incontinence

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Objective: To evaluate the prevalence rates for constipation and faecal and urinary incontinence in children attending primary care clinics in the United States.
Methods: Retrospective review of case records of all children, 4–17 years of age, seen for at least one health maintenance visit during a 6 month period and followed from birth or within the first 6 months of age in our clinics. We reviewed all charts for constipation, faecal incontinence and urinary incontinence.
Results: We included 482 children in the study, after excluding 39 children with chronic diseases. The prevalence rate for constipation was 22.6% and was similar in boys and girls. The constipation was functional in 18% and acute in 4.6%. The prevalence rate for faecal incontinence ($\geqslant 1$/week) was 4.4%. The faecal incontinence was associated with constipation in 95% of our children. The prevalence rate for urinary incontinence was 10.5%; 3.3% for daytime only, 1.8% for daytime with night-time and 5.4% for night-time urinary incontinence. Faecal and urinary incontinence were significantly more commonly observed in children with constipation than in children without constipation.
Conclusion: The prevalence rates were 22.6% for constipation, 4.4% for faecal incontinence and 10.5% for urinary incontinence in a US primary care clinic. Children with constipation had higher prevalence rates for faecal and urinary incontinence than children without constipation. Boys with constipation had higher rates of faecal incontinence than girls with constipation.

C onstipation is a common problem of children worldwide. Estimates of the prevalence rate of functional constipation in the paediatric population have varied from 4% to 37%.[1–5] The highest rates were reported from community surveys in Great Britain (34%)[1] and Brazil (28–37%).[3–5] Symptoms of constipation vary from mild and short-lived to severe and chronic and are sometimes accompanied by faecal impaction, faecal and urinary incontinence, urinary tract infections and abdominal pain.

Functional faecal incontinence is the loss of formed, semi-formed or liquid stool into the child's underwear. It can occur in the presence of functional constipation after the child has reached a developmental age of 4 years. In a minority of children, the faecal incontinence is not due to constipation or underlying disease and is called non-retentive faecal incontinence.[6 7] The prevalence rates for faecal incontinence have varied among studies, ranging in children from approximately 0.3% to 8%.[2 8 9] This wide range could be due to differences in survey methods, age distribution and/or definition. Prevalence rates for constipation and faecal incontinence in children in the United States are not known.

The objectives of our study were to evaluate the prevalence rates for constipation and faecal incontinence in children using our primary care paediatric clinics at the Children's Hospital of Iowa, United States for well child visits and to evaluate how many of these children have or had acute constipation or functional constipation. We also evaluated how many had faecal incontinence and daytime or night-time urinary incontinence.

PATIENTS AND METHODS
Patients and settings
To define the study population, we evaluated the case records of all children, 4–17 years of age, seen for at least one health maintenance visit in the primary paediatric clinics at the Children's Hospital of the University of Iowa, Iowa City, Iowa, during a 6 month period from January 1 to June 30, 2004. To

identify these children, a computer search was performed using the Current Procedure Terminology for well-child-visits as search terms. The computer identified 1002 children between the ages of 4 and 17 years. However, 481 of these children were seen for the first time in our clinic after 6 months of age and were therefore excluded. This left 521 children who started receiving medical care in our clinic before 6 months of age. Their complete case records were reviewed in detail for symptoms of constipation, age at onset of constipation, duration of constipation, treatment of constipation, and other symptoms such as faecal and urinary incontinence,

These children were the children of employees and students of the University of Iowa and children from the community and received their primary care in our clinics. The majority of the children were Caucasian, but because of the university, children of every race and nationality were included. Iowa City has a population of 80 000 and 30 000 students. The surroundings are rural. In the United States, most children receive their primary care from either a paediatrician or family physician. The primary care was provided initially by 10, increasing later to 17, staff pediatricians, with the author being one of them. In addition, 36 residents per year who were supervised by the staff pediatricians provided care. Referred patients were not evaluated in our primary care clinics and were not included.

The study was approved by the Institutional Human Research Review Committee.

Definitions
In functional disorders, there is no evidence of an inflammatory, anatomic, metabolic or neoplastic process. Functional constipation was defined in children $\geqslant 2$ years of age by two or more of the following characteristics during the previous 8 weeks: less than three bowel movements per week, one or more episodes of faecal incontinence per week, large stools in the rectum or felt on abdominal examination, passing of stools so large that they obstruct the toilet, retentive posturing

Table 1 Age distribution at the time of inclusion into the study (n = 482) and at the time of the first visit for constipation (n = 109)

	Age at time of inclusion into study		Age at first visit for constipation	
	n	%	n	%
Age distribution				
<1 years	–	–	14	13%
1–<2 years	–	–	12	11%
2–3 years	–	–	27	25%
4–5 years	161	33%	21	19%
6–7 years	89	18%	15	14%
8–9 years	63	13%	8	7%
10–11 years	62	13%	6	6%
12–14 years	62	13%	6	6%
15–17 years	45	9%	–	–
Age (years)				
Mean ± SD	8.6 ± 3.9		4.9 ± 3.7	
Median	7.5		4.1	

(withholding behaviour) and painful defecation. These are the Iowa criteria and have been used for the last 20 years in our primary and tertiary care clinics.[6] [10–13] This definition was also recently agreed upon by an international group of paediatric gastroenterologists and paediatricians gathered at the 2nd World Congress of Paediatric Gastroenterology, Hepatology and Nutrition in Paris in July 2004.[14] For constipation occurring in children <2 years of age, we used passage of hard, scybalous or pebble-like stools with straining/withholding or painful defecation for the definition of constipation.[15] Acute constipation was defined if symptoms and treatment lasted less than 8 weeks.

Functional faecal incontinence was defined as the involuntary loss of any amount of faeces into the underwear once a week or more often at present or in the past in a child after the age of 4 years.

Urinary incontinence was defined as leakage of urine at least once per week after age 5 years.[16]

Statistical analysis

The relevant information was abstracted and entered into a pre-designed data collection form. Fisher's exact test, t test and χ^2 test were used. Significance was accepted at $p<0.05$. Results were expressed as mean ± standard deviation (SD) or per cent.

RESULTS
Baseline characteristics

After manual case record review of 521 children, 4–17 years of age, we excluded 39 children with chronic diseases such as

Table 2 Prevalence rates for constipation and faecal incontinence in 482 children

	Prevalence rates		
	All children (n = 482)	Children with constipation (n = 109)	Children without constipation (n = 373)
Constipation	22.6%	100%	0%
Chronic	18%	79.8%	0%
Acute	4.6%	20.1%	0%
Functional faecal incontinence	4.4%	18.3%*	0.3%
Age in years (mean ± SD)	8.6 ± 3.9	8.3 ± 3.5	8.6 ± 4.0

*χ^2 = 66.7, p<0.001 as compared with children without constipation.

cerebral palsy, chromosomal abnormalities with mental retardation, and ulcerative colitis. Therefore, 482 children (245 boys and 237 girls) who had been followed since birth (n = 410) or within the first 6 months of age (n = 72) were included in this study. Their age (mean ± SD) was 8.6 ± 3.9 years and their median age was 7.5 years. The age distribution at the time of study entry is shown in table 1.

Constipation

Of the 482 children, 109 were evaluated for constipation at some time in their life. The prevalence rate for constipation was 22.6%. Constipation affected 55 boys (22%) and 54 girls (23%) (χ^2 = 0.01, p = 0.9). The constipation was functional in 87 children (18%) and acute (less than 8 weeks in duration) in 22 children (4.6%) (table 2).

The age and age distribution at the first visit for constipation are shown in table 1. The age at the first visit for constipation ranged from 0.1 to 14.9 years (mean 4.9 ± 3.7 years, median 4.1 years) and was not significantly different between children with functional constipation and acute constipation (p = 0.9). The onset of constipation occurred in 49% of the children before 4 years of age.

The symptoms reported by the parents and recorded in the case records and which defined constipation are given in table 3. Not all symptoms or physical findings were documented for each child, but constipation as defined in Patients and methods was documented in each child. Thirty two children were evaluated from January to June 2004 for constipation, resulting in a point prevalence of 6.6% for constipation.

Faecal incontinence

Twenty one children (18 boys and 3 girls) (4.4%) had seen a physician for functional faecal incontinence during their lifetime (table 2). The faecal incontinence was combined with functional constipation in 19 children (90%) and in 5% with acute constipation; in 5% no association with constipation was present. Significantly more boys (7.3%) than girls had suffered from faecal incontinence (1.3%) (χ^2 = 10.69, p<0.001). Significantly more boys with constipation (31%) had faecal incontinence than girls with constipation (6%; χ^2 = 11.69, p<0.001). Significantly more children with constipation (18.3%) had suffered from faecal incontinence than children without constipation (0.3%; χ^2 = 66.7, p<0.001). Six children with faecal incontinence were evaluated between January and June 2004, resulting in a point prevalence of 1.2% for faecal incontinence.

Urinary incontinence

Defining urinary incontinence as leakage of urine at least once a week after age 5 years, we found that the prevalence rate for urinary incontinence was 10.5% in 389 children. It was 3.3% for daytime urinary incontinence without night-time incontinence, 1.8% for daytime with night-time incontinence, and 5.4% for night-time urinary incontinence. Significantly more children with constipation than children without constipation had suffered from urinary incontinence (χ^2 = 15.17, p<0.001; table 4).

Table 5 gives the prevalence rates for urinary incontinence for boys and girls. The prevalence rates for any kind of urinary incontinence were not significantly different between boys and girls (χ^2 = 0.17, p = 0.686). Four children with daytime urinary incontinence, four children with day and night-time urinary incontinence, and 11 children with night-time incontinence only were evaluated between January and June 2004, resulting in a point prevalence of 1%, 1% and 2.8%, respectively.

Table 3 Symptoms of constipation (n = 109)

	Present	Per cent
<3 bowel movements/week	45	41.3%
Hard stools	90	82.6%
Large stool in the rectum	74	67.9%
Large stool in abdomen	41	37.6%
Stools obstruct the toilet	24	22%
Retentive posturing	34	31.2%
Abdominal pain	36	33%
≥1 times faecal incontinence/week	20	18.3%
Previous laxative treatment	43	39.4%

373 children did not have constipation (190 boys and 183 girls).

DISCUSSION

We found the prevalence rate for constipation was 22.6% in 482 children, 4–17 years of age, attending the general paediatric clinics at the Children's Hospital of Iowa. The reason for excluding children who joined our clinic after 6 months of age was because constipation often starts early in life. As shown in our study, constipation started before 1 year of age in 13% of the children. The constipation was functional in 18% and acute in 4.6% of the children. Other prevalence rates were 4.4% for faecal incontinence, 3.3% for daytime urinary incontinence, 1.8% for day and night-time urinary incontinence and 5.4% for night-time urinary incontinence. Boys with constipation had significantly higher rates of faecal incontinence than girls with constipation. The prevalence rates for faecal incontinence and urinary incontinence were significantly higher in children with constipation than in children without constipation.

In England, 34% of otherwise healthy 4–11 year old school children have suffered from constipation in the past according to questionnaires completed by parents.[1] In that study, constipation was determined by parent perception and no definition for constipation was used. The strength of our study is that the Iowa criteria for constipation have been used for the last 20 years in our clinic and all residents and staff are familiar with and use these criteria.[10–12] These same criteria requiring a duration of symptoms of at least 8 weeks for the definition of chronic constipation were agreed by an international group of paediatric gastroenterologists and paediatricians gathered at the 2nd World Congress of Paediatric Gastroenterology, Hepatology and Nutrition in Paris in July 2004.[14] We used the definition from the 1st World Congress for children <2 years of age[15] in our retrospective review.

The prevalence rate for faecal incontinence, defined by a frequency of ≥1/week, was 4.4% in our 482 children, 4–17 years of age. Defining faecal incontinence by a frequency of ≥1/month, the incidence rates for faecal incontinence in Stockholm's school children in 1963 were 2.8% in 4 year olds and 1.5% in 7–8 year olds.[8] A later study from Sweden in 1997 revealed that 9.8% of first graders and 5.6% of fourth graders suffered from faecal incontinence at least once a month.[17] Faecal incontinence of ≥1/month affected 4.1% of 5–6 year olds and 1.6% of 11–12 year old Dutch children, with an overall prevalence of 3%.[2] The faecal incontinence was coupled with constipation in 95% of our children. The association of faecal incontinence with constipation has been previously reported.[3 6 10 11] Faecal incontinence was present in 18.3% of our children with constipation and in 0.3% of our children without constipation. We found that constipation occurred with similar frequency in boys and girls, but faecal incontinence was much more frequently observed in boys than in girls. We have no explanation why faecal incontinence occurs much more frequently in boys, but this has also been reported in other studies.[2 8 17 18]

Table 4 Prevalence rates for urinary incontinence in children with and without constipation ≥5 years of age

	All children (n = 389)	Children with constipation (n = 87)	Children without constipation (n = 302)
Urinary incontinence:			
Daytime only	3.3%	5.7%	2.6%
Day and night-time	1.8%	3.4%	1.3%
Night-time only	5.4%	12.6%*	3.3%
Any kind	10.5%	21.8%*†	7.3%

*χ^2 = 11.52, p<0.001 as compared with children without constipation;
†χ^2 = 15.17, p<0.001 as compared with children without constipation.

We and others have previously reported on the high rates of urinary incontinence and urinary tract infections in children with constipation.[11 19–21] These rates, 29% for daytime urinary incontinence and 34% for night-time urinary incontinence,[10] were much higher than reported here, but children in this previous study and most other studies had suffered from longstanding constipation with or without faecal incontinence and were seen in tertiary care clinics. Children with constipation in our primary paediatric clinics received earlier intervention which may have prevented the faecal and/or urinary incontinence which often accompanies longstanding constipation. Daytime urinary incontinence (≥1/month) prevalence rates were 6.3% in Swedish first graders and 4.3% in fourth graders.[17] Overall prevalence of daytime urinary incontinence has been reported in 7–12 year old Japanese children to be 3.6% when defined as wetting >1/week in the last 6 months.[20] Using this definition, our 6 month rate for day wetting was 2.1%. Similar to our results, no significant difference in the prevalence rates for daytime urinary incontinence was found between boys and girls.[20]

Children in the USA receive their primary care either from paediatricians or family physicians in private practice or in community or hospital clinics. Therefore, our study population is similar to the population of children seen by community-based family physicians in Great Britain.

We present the first prevalence rates for constipation and faecal and urinary incontinence in children attending a primary care clinic in the United States. The prevalence rates were 22.6% for constipation, 4.4% for faecal incontinence and 10.5% for urinary incontinence. The children with constipation had higher rates of faecal and urinary incontinence than the children without constipation. The prevalence rates for faecal and urinary incontinence in children with constipation were much lower than reported from tertiary care clinics. Our data are more in agreement with prevalence rates from population surveys.

Table 5 Prevalence rates for urinary incontinence in boys and girls ≥5 years of age

	All children (n = 389)	Boys (n = 197)	Girls (n = 192)
Urinary incontinence			
Daytime only	3.3%	2.5%	4.2%
Day and night-time	1.8%	2%	1.6%
Night-time only	5.4%	6.6%	4.2%
Any kind	10.5%	11.2%	9.9%
Age (years)	9.6±3.6	9.7±3.5	9.5±3.7

What is already known on this topic

- Estimates of the prevalence rate of functional constipation in the paediatric population have varied from 4% to 37%. The highest rates were reported from community surveys in Great Britain (34%) and Brazil (28–37%).
- Symptoms of constipation vary from mild and short-lived to severe and chronic and are sometimes accompanied by faecal impaction, faecal and urinary incontinence, urinary tract infections and abdominal pain.

What this study adds

- The prevalence rates were 22.6% for constipation, 4.4% for faecal incontinence and 10.5% for urinary incontinence in a US primary care clinic.
- The prevalence rates for faecal and urinary incontinence in children with constipation seen in a primary care setting were much lower than reported from speciality clinics.

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